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**REMARKS**

Claims 1-18 are currently pending in the subject application and are presently under consideration. Favorable reconsideration of the subject patent application is respectfully requested in view of the comments herein.

**I. Rejection of Claims 1 and 4-7 Under 35 U.S.C. §102(b)**

Claims 1 and 4-7 are rejected under 35 U.S.C. §102(b) as being anticipated by Bartha (US 5,635,337). It is respectfully submitted that this rejection be withdrawn for at least the following reasons.

For a prior art reference to anticipate, 35 U.S.C. §102 requires that "each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950 (Fed. Cir. 1999) (*quoting Verdegaal Bros., Inc. v. Union Oil Co.*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987)).

According to claim 1, the subject application involves etching the insulative layer through the first patterned photoresist layer and the second patterned photoresist layer simultaneously in a single etch process, wherein the first image and the second image are substantially formed in the (at least one) insulative layer. Thus, the features or structures are formed in the insulative layer at the same time in a single etch process.

The Examiner contends that Bartha anticipates the subject application; however, Applicants respectfully disagree. Bartha explicitly describes multiple etch processes that are employed to form a multi-step structure in a substrate. In particular, Bartha teaches "transferring the first opening (4) to the substrate (1)" followed by removing the first photoresist layer (2) and part of the top-most photoresist layer (5) and then "transferring the second opening (7) to the substrate (1) and deepening the first opening (4) (see col. 2, ll. 5-12). Thus, Bartha does not teach or disclose the formation of a multi-step structure in a single etch process as required by the claimed invention.

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In addition, the subject application involves patterning a first image into a first photoresist layer and then curing the first patterned photoresist layer. As described in the specification, the first patterned photoresist layer is polymerized or cured to make it chemically resistant to the effects of organic solvents and/or developers. The curing process or step is critical in preserving the integrity of the first patterned photoresist layer when subsequently patterning a second photoresist layer formed thereon. Bartha does not disclose or teach curing the lower photoresist layer. Rather, Bartha merely recites that the photoresist layer is developed and post-baked. Hence, Bartha fails to teach each and every element of the subject invention as recited in the claims.

In view of the foregoing, the rejection against claim 1 and claims 4-7, which depend therefrom, should be withdrawn.

## **II. Rejection of Claims 2-3 Under 35 U.S.C. §103(a)**

Claims 2 and 3 are rejected under 35 U.S.C. §103(a) as being unpatentable over Bartha ('337) as applied to claim 1 above, and further in view of Chang (US 4,165,395). It is respectfully submitted that this rejection be withdrawn for at least the following reasons. Claims 2 and 3 depend from claim 1. Therefore, the arguments and remarks above with respect to Bartha as applied to claim 1 also apply herein.

To reject claims in an application under §103, an examiner must establish a *prima facie* case of obviousness. A *prima facie* case of obviousness is established by a showing of three basic criteria. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. See MPEP §706.02(j). The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure. See *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

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In addition to the discussion set forth above with respect to claim 1, Chang fails to cure the aforementioned deficiencies of Bartha and in fact, teaches away from the claimed invention. The subject application relates to forming dual damascene structures in a single etch step or process. More specifically, the first patterned photoresist layer is cured prior to forming the second photoresist layer thereon. In particular, the curing comprises irradiating the first patterned photoresist layer with ultraviolet light at an energy dose and duration sufficient to make the first patterned photoresist layer chemically resistant to organic solvents and developers. Thus, the ultraviolet irradiation exposure effectively polymerizes and preserves the images formed in the first photoresist layer.

In particular, Chang does not teach or suggest the formation of multi-step or dual damascene features in a single and simultaneous etch process as claimed herein but is relied upon for its apparent teaching of ultraviolet radiation. Chang describes that a lower photoresist layer is exposed to x-ray or ultraviolet radiation, and then developed to yield a very high aspect ratio. Chang states:

... [A] wafer or a mask plate is covered with a layer of resist 11 which is sensitive to radiation from the X-ray to the optical range of frequencies... Next, a thin metallic film 12 ... is deposited on top of resist 11. ... Above film 12, a layer of an electron beam sensitive ... resist 13 ... is deposited...

In FIG. 1B, there are shown holes 14 in resist 13 ... when the resist is developed.

In FIG. 1C, the product of the steps of FIG. 1B is shown after the metallic film 12 has been removed through the holes in resist 13...

FIG. 1D shows the product of the steps of FIG. 1C after it has been subject to exposure by an actinic radiation in whichever frequency range to which the resist 11 is sensitive. **The portions of the resist 11 below the holes 14 are then exposed and subsequently developed to expose the substrate 10.** (col. 3, ll. 56 – col. 4, ll. 44).

As can be seen from the above, the ultraviolet radiation in Chang causes the removal of exposed portions of resist material 13 to yield holes 14. The Examiner contends that the ultraviolet radiation in Chang would have the same result in the claimed invention (Paper 20060215, page 6, ¶15). However, Chang's actinic

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radiation exposure contradicts that of the subject invention. In the present claims, the ultraviolet radiation preserves the pattern by making it resistant to developers whereas in Chang, the ultraviolet radiation causes removal of material upon development. Thus, Chang teaches away from preserving a patterned photoresist layer via exposure to the ultraviolet radiation. Hence, one of ordinary skill in the art would not have been motivated by Chang to irradiate the first patterned photoresist layer using ultraviolet light to stabilize and/or preserve the images patterned therein, as claimed in the present invention.

The Federal Circuit has held that teaching away from the art of the subject invention is a per se demonstration of lack of prima facie obviousness. In re Dow Chemical Co., 837 F.2d 469, 5 USPQ2d 1529 (Fed. Cir. 1988). Therefore, Chang fails to teach or suggest the claimed invention alone or in combination with Bartha. Furthermore, Chang teaches away from the subject application and as a result, fails to provide the requisite motivation to modify Bartha in order to perform the subject invention.

In view of the foregoing, the rejection should be withdrawn.

### **III. Rejection of Claim 8 Under 35 U.S.C. §103(a)**

Claim 8 is rejected under 35 U.S.C. §103(a) as being unpatentable over Bartha ('337) as applied to claim 1 above, and further in view of Chang ('395). It is respectfully submitted that this rejection be withdrawn for at least the following reasons.

Claim 8 depends from claim 1. The arguments set forth above with respect to Bartha as applied to claim 1 apply herein as well. As previously asserted, Chang fails to cure the aforementioned deficiencies. In particular, Chang fails to teach or suggest forming dual damascene patterns in a single etch process or curing the first patterned photoresist layer as further explained above with respect to claims 2 and 3, which also depend from claim 1.

In view of the foregoing, it would not have been obvious to one of ordinary skill in the art to modify Bartha in view of Chang to perform the present invention. Therefore, the rejection should be withdrawn.

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**IV. Rejection of Claims 9-13 Under 35 U.S.C. §103(a)**

Claims 9-13 are rejected under 35 U.S.C. §103(a) as being unpatentable over Bartha ('337) in view of Chang ('395). It is respectfully submitted that this rejection be withdrawn for at least the following reasons.

The arguments presented in section II above apply to the rejection of claims 9-13 as well. As previously discussed, the claimed invention recites that the first patterned photoresist layer is irradiated with ultraviolet light to stabilize the first patterned photoresist layer before the second photoresist layer is formed thereover. In particular, the irradiation of the first patterned photoresist layer occurs at an energy dose and duration sufficient to make the first patterned photoresist layer chemically resistant to organic solvents and developers. Thus, the ultraviolet irradiation exposure effectively preserves the images formed in the first photoresist layer.

Recall that Chang describes that a lower photoresist layer is exposed to x-ray or ultraviolet radiation and then the exposed portions are removed during development to yield holes. In short, Chang's actinic radiation exposure contradicts that of the subject invention and in fact, teaches away from preserving a patterned photoresist layer via exposure to the ultraviolet radiation. Hence, one of ordinary skill in the art would not have been motivated by Chang to irradiate the first patterned photoresist layer using ultraviolet light to stabilize and/or preserve the images patterned therein, as claimed in the present invention. Moreover, it would not have been obvious to one of ordinary skill in the art at the time the invention was made to modify Bartha in view of Chang to perform the present invention. Therefore, the rejection should be withdrawn.

**V. Rejection of Claim 14 Under 35 U.S.C. §103(a)**

Claim 14 is rejected under 35 U.S.C. §103(a) as being unpatentable over Bartha ('337) in view of Chang ('395) and further in view of Dai ('076). It is respectfully submitted that this rejection be withdrawn for at least the following reasons.

Claim 14 depends from claim 9. The arguments set forth above with respect to Bartha as applied to claim 9 apply herein as well. Dai fails to cure the

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aforementioned deficiencies of Bartha and Chang with respect to at least claim 9 of the subject application. That is, Dai does not teach or suggest irradiating a first patterned photoresist using ultraviolet light in order to stabilize the images formed in the patterned photoresist layer. Thus, Bartha, Chang, and Dai, either alone or in any combination fail to teach or suggest each and every element of the claimed invention. Hence, the subject application would not have been obvious to one of ordinary skill in the art at the time the invention was made. In view of the foregoing, the rejection should be withdrawn.

**VI. Rejection of Claims 15-18 Under 35 U.S.C. §103(a)**

Claims 15-18 are rejected under 35 U.S.C. §103(a) as being unpatentable over Bartha ('337) in view of Chang ('395) and apparently Dai ('076). It is respectfully submitted that this rejection be withdrawn for at least the following reasons. Claims 15-18 depend from claim 9. The arguments set forth above with respect to Bartha and Chang in reference to claim 9 apply herein as well.

The Examiner acknowledges that Bartha in view of Chang and Dai ('076) differ from the present invention in failing to teach that etching the at least one insulative layer through the patterned negative tone photoresist layer and the second patterned photoresist layer further comprises employing an etch chemistry that ablates a pre-determined amount of the patterned positive tone photoresist layer during the etching process without substantially affecting the patterned negative tone photoresist layer, as recited in present claim 17; and that the etch chemistry is highly selective to the patterned negative tone photoresist layer and to the at least one insulative layer than to the second patterned photoresist layer, as recited in present claim 18.

Furthermore, Dai fails to make up for the aforementioned deficiencies of Bartha and Chang with respect to claim 9. In particular, Dai does not teach or suggest forming a dual damascene structure in a single etch process or irradiating a first patterned photoresist using ultraviolet radiation in order to stabilize the images formed in the patterned photoresist layer. Rather, the dual damascene structure in Dai is formed in multiple etch steps. Thus, Bartha, Chang, and Dai, either alone or

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in any combination fail to teach or suggest each and every element of the claimed invention. Hence, the subject application would not have been obvious to one of ordinary skill in the art at the time the invention was made. Thus, the rejection should be withdrawn.

#### **VII. Conclusion**

The present application is believed to be condition for allowance in view of the above comments and amendments. A prompt action to such end is earnestly solicited.

In the event any fees are due in connection with this document, the Commissioner is authorized to charge those fees to Deposit Account No. 50-1063.

Should the Examiner believe a telephone interview would be helpful to expedite favorable prosecution, the Examiner is invited to contact applicant's undersigned representative at the telephone number listed below.

Respectfully submitted,

AMIN & TUROCY, LLP



Gregory Turocy  
Reg. No. 36,952

24<sup>TH</sup> Floor, National City Center  
1900 E. 9<sup>TH</sup> Street  
Cleveland, Ohio 44114  
Telephone (216) 696-8730  
Facsimile (216) 696-8731